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The Citrus Industry

FLORIDA'S EXCLUSIVE CITRUS MAGAZINE

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Loyal Americans everywhere are solidly behind our government in its determination to build up a defense program in our nation that will prepare us to meet any eventuality . . . regardless of political affiliations or other associations we all realize that such a program is costly — but unquestionably necessary . . . since the cost of the job our government is carrying on must ultimately be met by the nation's taxpayers, those of us who are engaged in the production of fruit and vegetables must develop that production to a point where the superior quality of our products will command the highest premium prices . . . so now and all through the year it will be to the individual interest of every Florida grower to exert every effort to build the finest crops he has ever produced.

August
1941

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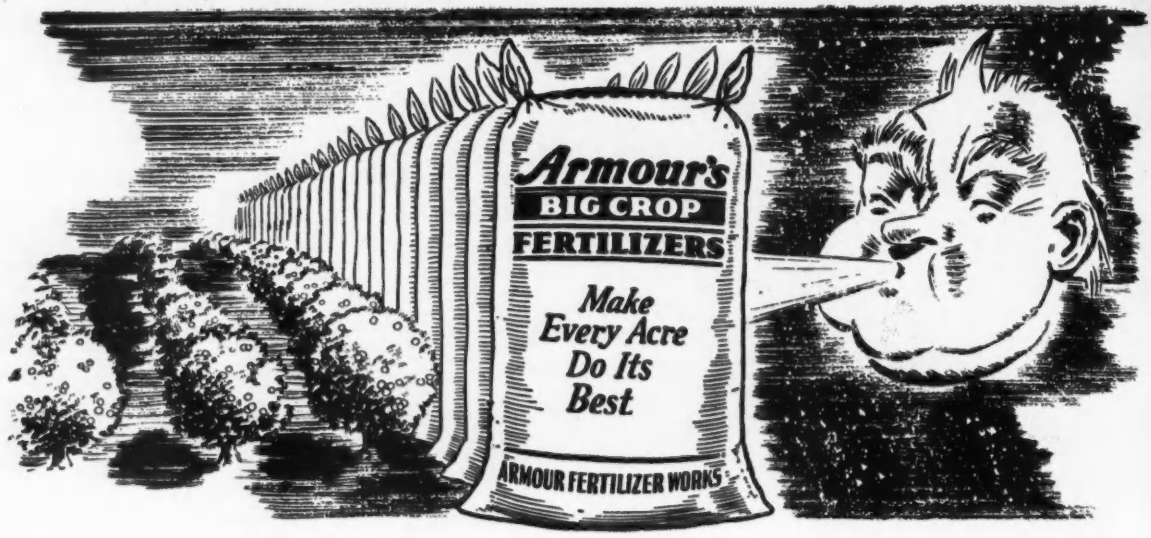

DEFEND *Your Young Citrus Trees* AGAINST WINTER - - - *With Armour's*

Experienced growers know how necessary the fall fertilizer application is for young citrus trees — those trees from one to five years old whose resistance must be built up for the winter months ahead. The size and quality of future yields can depend on that application, so plenty of successful growers around here are using BIG CROP — the PROVEN fertilizer.

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ARMOUR FERTILIZER WORKS

Jacksonville Florida

Effect Of . . .

Freeze Damage on Citrus Trees and Fruit

. . . In Relation To Grove Practices

BY W. W. LAWLESS
ASSISTANT HORTICULTURIST
Citrus Experiment Station, Lake Alfred, Florida, At Meeting of Florida State Horticultural Society.

At the meeting of this Society last year a preliminary report was presented on the factors influencing cold resistance in citrus (1). At this time it is desired to discuss not only the factors influencing cold damage in citrus but also to follow the recovery of the trees through the season. It is common knowledge that in the freeze of January, 1940, as in previous freezes certain groves withstood the cold better than other groves and that there was a difference in the resistance of trees in the same grove. The changing fertility program, involving the acceptance of magnesium, manganese, copper, and zinc as necessary tree nutrients, has vastly changed the aspect of citrus culture and has formed a basis for an explanation of tree resistance to cold.

In the subsequent discussion the term "complete nutritional program" involves the proper use of nitrogen, phosphorus, potassium, magnesium, manganese, copper, and zinc together with pH control of the soil when desirable. An "incomplete program" may consist of only nitrogen, phosphorus, and potassium or these three elements with the improper use of the four so-called minor elements mentioned above. To illustrate, a complete nutritional program on a Norfolk sand would include the use of dolomite or other basic materials to maintain the proper pH of the soil, nitrogen, phosphorus, potassium, magnesium, manganese, and copper in the fertilizer, and manganese, copper, and zinc in the regular spray program for insect and disease control. An incomplete program may include only nitrogen, phosphorus, and potassium and no basic materials to control the pH of the soil in spite of the fact that the fertilizer will be decidedly acid in reaction if the nitrogen is derived from sulfate of ammonia.

The term "complete fertilizer," as often used to indicate a fertilizer containing nitrogen, phosphorus, and potassium, is unfortunate in that it is decidedly incomplete by present standards of nutritional requirements. In any subsequent discussion, as well as in the older connotation of the word "complete", calcium and sulfur are included incidental to the use of the other elements.

Several factors determine freeze damage and may be classified as (1) location, (2) time and degree of cold, (3) varietal resistance, (4) grove management, and (5) cold protection by other means.

Varietal differences were reported last year (1) and will not be considered at this time nor will protection by other means be discussed. The location includes the land contour, drainage, soil type, etc., and only nature can effect any material change. The time and degree of cold has a very definite influence upon the resulting damage. An early fall or early spring cold will cause more foliage and tree damage than a cold of equal intensity during midwinter. Lower temperatures were experienced in the freeze of January, 1940, than in any of the previous freezes yet relatively little tree damage resulted. The extreme dormancy of the trees was undoubtedly the most important single factor but by no means the only factor. Improved tree condition resulting from better fertility progarms was nearly as large a factor, and the conclusion is advanced that had bronzing, frenching, and dieback been as general and severe as they were ten years ago infinitely more damage would have resulted. The discussion of grove management will forcibly point out that the fertility program is a measurable index to the degree of cold damage that may be expected. Also, it will be shown that a vigorous and healthy tree is more able to withstand low temperatures than a starved and unhealthy tree.

In this paper will be found data and observations from plots at the Citrus Experiment Station. Several specific varieties on rough lemon rootstock will be used in the discussion, but all varieties and rootstocks under comparable conditions gave similar results. Tables 1, 2 and 3 are given to briefly review the temperatures that existed and the resultant damage.

That a healthy and vigorous tree resulting from a complete nutritional program can survive lower temperatures and recover more rapidly than a tree in a weakened condition was clearly shown in a block of 12-year old Pineapple orange trees. In this block the temperature was below 20 degrees F. for about eight hours, resulting in heavy tree and fruit damage. Although six to 18 inches of dead or injured wood was pruned from these trees, a very satisfactory growth and bloom was produced during the spring and summer and practically no dying of cold injured twigs occurred during the season. During the freeze of November, 1940, the temperature dropped as low as 22 degrees F. in this block. The fruit was thoroughly frozen, but the foliage suffered little damage, even after a severe shock the preceding January. This fruit, although thoroughly frozen, did not dry out and drop but continued to grow and minimize the effects of freezing — a quality that is not generally characteristic of Pineapple oranges. This block averaged about two boxes per tree of marketable fruit, with sizes averageing from 176's to 200's.

Zinc and copper deficiencies greatly decreased cold resistance and retarded recovery. A block of Pineapple orange trees receiving three applications per year of a fertilizer containing 40 per cent water insoluble organic nitrogen but deficient in both zinc and copper suffered heavy foliage damage while an adjacent block on a complete nutritional program suffered very little foliage damage. Trees deficient in zinc and copper produced a heavy flush of growth, although the leaves were small, and a heavy bloom; the fruit matured slowly and at the time it was picked in January averaged about three boxes per tree, with 71 per cent of it being 228's or smaller. The adjacent block of Pineapple orange trees on the complete nutritional program produced a very vigorous growth and set a heavy crop of fruit. Both the fruit and foliage matured normally with apparently no ill effects from the cold. These trees averaged about four boxes per tree of richly colored, smooth textured fruit, 60 per cent of it being

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Borers In Shade Trees

By J. R. WATSON, Entomologist, Florida Experiment Station

Shade trees, especially oaks, on our lawns and along our streets are apt to be attacked, particularly at this time of the year, by several kinds of borers. Some of these, like the one that works in pecans, make good-sized holes — as big as a small lead pencil — directly into the center of a healthy living tree, where they work up and down, doing a great deal of damage. These borers are rather easy to control. With a medicine dropper squirt into the hole a few drops of carbon bisulfide, and immediately stop the hole up with moist clay, gum, or putty. Or one may dip a little cotton into the carbon bisulfide and push this into the hole. Sometimes a wide headed nail driven into the hole will stop the flow of sap and drown the borer.

Another type of borer, known as the flat-headed borer, works just under the bark of the tree, and may work all the way around the trunk of a small tree, thus girdling it. These borers are particularly apt to attack a tree which has recently been transplanted or one whose bark is unduly exposed to sunlight and suffers from sun-scald. These flat-headed borers are the larvae of beetles and the best way to handle them is to cut out the borers with a knife, taking pains not to cut cross-wise of the living bark, but to make such incisions as are necessary parallel with the trunk of the tree. When trees whose natural habitat is in the shade of other trees, like holly or dogwood, are transplanted into an open situation where they are exposed to the sun, their bark is apt to suffer from sunscald and, then, this borer.

A third type of borer, and perhaps the most common of all, makes very small holes in the bark, which look as though the bark had been peppered with buck-shot. For this reason they are called "shot-hole" borers. Usually when a tree has been invaded by these borers it is a very poor life insurance risk. Sometimes, however, if the injury can be discovered in the early stages of the invasion, whitewash on the trunk and larger limbs will save the tree. Make the whitewash quite liquid so that it will fill up all the cracks and crannies of the bark. To make it stick better add a handful of salt to each three gallons of the whitewash. These borers, like the flat-headed borers, will not ordinarily attack a healthy tree. The flow of sap from a healthy tree will drown them in their burrows, so the most important thing of all in combatting the borers is to keep the trees in a rapidly growing condition.

Trees planted along our streets and in our yards are under unnatural conditions. Sidewalks, pavements, and the foundations of houses interfere with the proper development of the roots, and furthermore the leaves are usually raked up and carried away or burned. Leaves are the natural fertilizer of the tree, and also act as a mulch to keep the ground from drying out excessively during dry periods, so that a tree under these conditions needs extra care. To compensate for this loss of fertilizer, commercial fertilzer should be added from time to time, and the trees should be watered during dry periods such as we are apt to have during April and May especially.

Another important measure is to

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The Vitamin C, Solids and Acid In Orange and Grapefruit Juices Used For Canning Purposes....

DR. EDWARD ROSS*, CHEMIST
of The Dr. P. Phillips Canning Co., Orlando, Florida, At Meeting Florida State Horticultural Society

The data presented in this report were obtained from the daily laboratory records of orange and grapefruit juices extracted for canning purposes by the Dr. P. Phillips Canning Co. From a compilation of these records it has been possible to show seasonal levels and intraseasonal trends of vitamin C, total soluble solids and total acid. An interesting probability distribution has been noted for vitamin C and acid, and an association indicated between these.

A laboratory situated in a canning plant offers an excellent opportunity to participate in an investigation of this nature. Composite samples of large quantities of fruit were available. Juice was extracted each day from thousands of boxes of fruit. Tests were made on samples drawn from 160 gallon tanks of freshly reamed juice. Tables 2 and 3 show monthly averages for about 10,000 boxes of fruit. The yearly averages, then, represent roughly 70,000 boxes.

Methods And Materials

Idiometric titration (6) was the routine procedure employed for vitamin C assays of the fresh juice. Titration with a standard solution of the dye, sodium 2, 6-dichlorobenzenoneindophenol (2), was often used for check determinations. After preliminary experiments with these procedures, certain slight modifications were made for the sake of expediency in routine testing. The sacrifice of the refinements and exactness of the original methods was found necessary to keep pace with canning plant operation conditions. Additional acidification and back-titration were dispensed with in the idiometric procedure. Purfication by ether extraction was the sacrifice made in the dye procedure. With these modifications it was found that the first solid blue of the starch indicator and the first full pink of the dye change were quite satisfactory end-points. For the routine work the dye was standardized against grapefruit juice the vitamin C of which had been determined by iodine titration. Twenty-five ml. samples of juice were titrated with standard 0.01 N iodine, and 10 ml. samples with 0.05% dye solution.

The methods thus employed were found to be reproducible and exact to about 2%. Check tests using pure ascorbic acid, both in acid solution and added to grapefruit juice, verified this accuracy.

The usual brix hydrometer was used to obtain total soluble solids. Acid was determined by titration, with standard NaOH using phenolphthalein as indicator, and reported in terms of per cent anhydrous citric acid.

The fruit was brought to the canning plant from innumerable groves of Orange and adjacent counties. All the fruit was subject to regular State requirements for canning grade and maturity. On entering the canning plant the fruit was washed and brushed. Grapefruit was conveyed to machines where it was quartered and juiced by revolving burrs. Oranges were halved and passed to a table where they were juiced by hand on revolving burrs. Immediately upon extraction the juice entered stainless steel tubes, passed through revolving screen and then to closed 160 gallon tanks, from whence samples were drawn.

The individual daily tests were made on samples from 160 gallons of freshly reamed juice. A random selection of 10 values was taken to compute the average for the day. For instance, if tests were obtained from 80 tanks of juice, the value for every eighth tank was used to calculate that day's average. Solids and acid measurements were made on samples from every tank of juice canned, therefore, usually 10 values were available for averaging. Approximately 80% of the daily vitamin C averages were calculated from between 5 and 10 determinations,

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* This study was devised to parallel a broad program of investigation and control by my colleague, Mr. Theodore J. Kew, and his data on solids and acid were utilized for this report. Acknowledgement is made to Mr. Howard Phillips, upon whose suggestion this work was originally begun.

EFFECT OF FREEZE DAMAGE ON CITRUS TREES AND FRUIT IN RELATION TO GROVE PRACTICES.

(Continued from page 3)

over size 200 with a high percentage of No. 1 grade.

There was neither time nor opportunity to carry out a thorough investigation of immediate effects of fertilizer and cultural methods on recovery; however, it was deemed advisable to follow up certain phases of the recovery. The general opinion has been that cold injured trees should be quickly irrigated, fertilized and cultivated after a freeze. To check the efficiency of such practices in aiding recovery, one-half of a block of 15-to-18-year old Pineapple orange and Valencia orange trees was irrigated immediately after the freeze and divided into three plots, one of which was cultivated with an acme harrow, one left uncultivated, and one fertilized with five pounds of nitrate of soda per tree. It is interesting to note that the check plot which was neither cultivated, irrigated, nor fertilized produced satisfactory growth and bloom just as rapidly as did the trees which were cultivated, irrigated, and fertilized. This may not be true after every freeze because frequent rains following the January freeze probably eliminated any differences that would have resulted from irrigation. Irrigation and cultivation had no effect on the recovery of three-year old trees that were 100 per cent defoliated.

A pruning experiment was carried out on a small scale immediately following the freeze on four rows of trees on which the limbs were damaged from three to 36 inches from the tips. Pruning records show that less dead wood was pruned from the check trees in early summer than from the trees pruned immediately after the freeze. Furthermore, the earlier pruned trees continued to die back and it was necessary to prune them again in the summer, indicating that pruning cold injured trees soon after a freeze weakens the wood and increases the ultimate loss of wood.

Nitrogen, phosphorus, and potash played a very minor role in determining resistance to low temperatures, no differences being found probably because no plots with acute deficiencies of these elements were available. However, it is interesting to note that three-year old trees which had been on a one-year program of no potash to 16 per cent potash showed no differences in cold damage or rate of recovery.

Several blocks on the Citrus Experiment Station property were available for studying cold damage and the recovery induced by various nutritional programs. In order to show the striking differences induced by these nutritional programs Table 2 is given, showing the effects of the cold in the old Nitrogen Source experiment. Three years ago these trees were acutely deficient in zinc, copper, manganese and magnesium as a result of a 17-year program of N-P-K fertilization. The various plots were subdivided in the spring of 1938 and several combinations of the deficient elements were added to show their individual and combined effect upon the tree and fruit.

An examination of the injury suffered in these plots from the freeze of January, 1940, indicated that the weakened condition of the trees predisposed them to cold damage more than any other factor. The plot on an N-P-K program alone had the highest percentage of defoliation and injured fruit (90 and 94 per cent, respectively). Applications of zinc and copper and zinc, copper, and manganese sprays reduced the degree of defoliation; however, the use of these elements increased the size of the crop and consequently

TABLE 1
Duration of Low Temperatures in Experimental Plots at Lake Alfred

Location	Jan. 26	Jan. 27	Jan. 28	Total Hours
	Hours Below 20° F.			
Station* 1	0	.5	3.0	3.5
Station 2	0	5.0	2.5	7.5
Station 3	0	7.0	3.25	10.25
	Hours Below 25° F.			
Station 1	3.25	10.0	9.5	22.75
Station 2	3.0	10.0	9.0	22.0
Station 3	3.25	12.5	10.0	25.75

*1. Forecast Station.
2. Cultivated Grove.
3. Non-cultivated grove on same level as 2.
(Above table copied from Lawless and Camp (1), 1940.)

TABLE 2
Effect of Nutritional Conditions on Cold Injury in Pineapple Oranges and Marsh Seedless Grapefruit

Treatment	Pineapple Oranges				Marsh Seedless Grapefruit
	Percent Fruit Damage 1	Percent Fruit Drop 2	Percent Leaf Drop 3	Percent Leaf Damage 4	Percent Leaf Drop
N-P-K	94	93.1	88.9	90	65.1
N-P-K+Zn+Cu	79	89.2	75.1	87	63.6
N-P-K+Zn+Cu+Mn	84	89.1	71.1	73	78.0
N-P-K+Mg	91	67.5	68.8	60	31.9
N-P-K+Zn+Cu+Mn+Mg	65	68.9	39.4	42	21.4

1. Percent fruit damage determined on basis of one-half inch cut at the stem end ten days after freeze.
2. Percent fruit drop recorded up to March 19, 1940.
3. Percent leaf drop determined by leaf counts on tagged twigs.
4. Percent leaf damage estimated.

intensified the magnesium deficiency, creating a weakened tree condition and for this reason predisposed the trees to cold damage. Much of this cold damage was attributable mainly to magnesium deficiency as magnesium used in a complete program with zinc, copper, and manganese reduced defoliation from 90 per cent to 43 per cent. The use of any one of the four secondary elements reduced cold damage, but no substantial reduction was noticeable except where all four elements were used together. This fact was vividly portrayed in a block of Marsh Seedless grapefruit on a similar program in which the application of zinc and copper and zinc, copper, and manganese increased the crop about 60 per cent over the N-P-K program. This heavier cropping intensified the magnesium deficiency, predisposing the trees to cold injury and resulting in more deadwood than the N-P-K program alone. However, a complete nutritional program, including all four elements, produced a very noticeable reduction in cold damage.

The fruit damage of both Pineapple oranges and Marsh Seedless grapefruit paralleled the tree damage. The application of zinc and copper and zinc, copper, and manganese decreased the damage as compared with the N-P-K program, but when magnesium was used in addition to these elements there was a very significant reduction of both fruit damage and droppage. A definite factor resulting in less dropping was probably the tenacity with which the fruit hung on the trees at the time of the freeze. This factor plus less fruit and foliage damage, which left the trees in a stronger condition, gave the fruit more vitality to overcome the injury.

TABLE 3
Effect of Fertilizers on Cold Resistance of Seedy and Seedless Varieties of Grapefruit

Treatment	Variety	Percent Fruit Damage 1	Percent Fruit Drop 2
Basic Organic Plus Zn, Cu, Mn and Mg	Seedless	85	16.1
	Seedy	70	22.0
Acid Inorganic N-P-K Only	Seedless	95	48.9
	Seedy	100	67.0

1. Percent fruit damage determined on basis of one-half inch cut at stem end ten days after freeze.
2. Percent fruit drop recorded up to Feb. 29, 1940.

(Above table copied from Lawless and Camp (1), 1940).

The recovery of the trees in this block explains much of what has been unanswerable in previous freezes. The trees on the N-P-K program produced a fair flush of growth on both new and very old wood but a very weak bloom of which very little set and stil less fruit matured. The leaves were very small, showing patterns of zinc, copper, and manganese deficiencies and never becoming normal in size, and wood continued to die back throughout the season. The addition of zinc and copper and zinc, copper, and manganese as sprays greatly increased the growth, bloom and set of fruit. Most of the growth on these trees occurred on the smaller twigs and the leaves were of normal size, showing no deficiency symptoms. However, the use of magnesium in addition to zinc, copper, and manganese resulted in far superior recovery. Trees on this program, although subjected to the same degree of cold, showed a medium amount of damage and produced a heavy flush of growth; leaves were normal and a heavy bloom was set.

The amount of dead wood pruned from the trees in these plots is shown in Table 4. At first inspection it would appear that zinc and copper and zinc, copper, and manganese predisposed the trees to cold injury. Trees on the N-P-K program produced only 134 pounds of fruit in 1939-40 and 9.27 pounds of dead wood per tree while the trees receiving zinc and copper produced 401 pounds of fruit and 13.65 pounds of dead wood and the trees receiving zinc, copper, and manganese produced 336 pounds of fruit and 11.52 pounds of dead wood per tree. This increased amount of dead wood was a direct reflection of the crop that

(Continued on page 16)

TABLE 4
Influence of Fertility Programs Upon Recovery of Cold-Damaged Pineapple Oranges and Marsh Seedless Grapefruit

Treatment	Pineapple Oranges								Marsh Seedless Grapefruit
	Size of Fruit*			Grade of Fruit*		Production lbs./tree		Deadwood lbs./tree	Deadwood lbs./tree
	324 & 288	250, 216 & 200	176, 150 & 126	No. 1 & No. 2	No. 3	1939-1940	1940-1941	1940	1940
N-P-K	11.6	81.5	7.0	45.3	54.7	124	160	9.27	10.56
N-P-K-Zn-Cu	21.6	47.6	30.8	88.5	11.5	401	166	13.65	18.9
N-P-K-Zn-Cu-Mn	21.7	32.2	46.1	80.7	19.3	336	172	11.52	10.3
N-P-K-Mg	10.0	55.0	35.0	71.1	29.0	273	258	3.35	9.35
N-P-K-Zn-Cu-Mn-Mg	9.2	55.1	34.6	88.5	11.5	491	327	4.30	7.25

*1940-41 Season

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SUPER CARS

The Florida Citrus Commission, acting on numerous inquiries and requests from members of the industry in Florida, is giving serious consideration to the subject of the new "supercars" developed and in actual use in the San Gabriel Valley in California.

This new type refrigerator car is designed to carry a load of 924 boxes of citrus fruit, or twice the capacity of the ordinary 462-box refrigerator car in general use. The car is especially designed to meet the constant demand coming from California fruit men for something that will effect a saving in carrier charges.

Higher and longer in build, it is an innovation which commands the attention of all fruit growers and shippers. Fruit is loaded in three tiers instead of two, and is cooled by ice bunkers containing 13,500 pounds of ice as against 10,000 pounds in the present type car. The first car of this type was recently loaded in the San Gabriel Valley with a capacity of 90,000 pounds as against the old capacity of 65,000 pounds.

Some California citrus men are of opinion that this is the coming type of car for future citrus shipments, but others are of opinion that only a small number of such cars will be found practical for use in citrus shipments, and these only when shipped to markets where the fruit can be distributed within a short radius. They contend that difficulty may be experienced in selling a double car of fruit in many markets, and also in selling part of a load in one place and part in another. This is the view held generally by Florida citrus shippers whom this publication has been able to contact.

However, the Florida Citrus Commission has made studies in transportation problems, working with the United States Bureau of Plant Industry, and has investigated the possibilities of using a heavily loaded car. Six hundred and thirty boxes of fruit were loaded into one car by piling them six high on a side, and the results of these loadings are said to have been satisfactory. J. R. Winston, senior horticulturist at the bureau, in refrigeration studies, made experiments in half-stage icing, using the top half of the bunkers. It was found that this form of icing resulted in lower temperatures at the top of the load and not such extremely low temperatures for the bottom, as is usually the case.

While agreeing that heavily loaded cars should have the effect of lowering carrier charges, most Florida shippers seem to feel that there is considerable question as to the practicality of their general use owing to the objections voiced above. However, the results of general use by California shippers, should it come about, will be watched with a great deal of interest by Florida growers and shippers.

MAKING A GOOD START

The recently appointed Florida Citrus Commission is making a good start in tackling the problems of the industry as evidenced by numerous acts immediately following the organization of the new Commission.

One of these steps is the release of the revised edition of "Citrus Fruits and Health," a publication prepared specifically for the use of the medical and dental profession. The new text is written with special emphasis on the food problems now being experienced in the national defense move, and the advisability of obtaining vitamins and other health factors in their natural form. Twenty thousand copies of the first edition have been distributed to professional men in every state in the Union and in many foreign countries.

It is said that the first edition has been received with enthusiasm by doctors and dentists everywhere. The revised edition contains additional findings in the use and benefits of both fresh and canned citrus fruits in the prevention and cure of certain diseases and their beneficial effects on the teeth and gums. The extremely low cost of obtaining vitamin C from citrus fruits is emphasized in the book with tables showing the respective cost of vitamins in several of the more common foods. Only five furnish 100 milligrams of vitamin C for 8 cents or less while citrus fruit in any form supplies this quantity of vitamin C at an average cost of only 3.2 cents.

Another of the citrus problems considered by the Commission is that of the practice of overloading containers in which citrus fruit goes to market. Hearings have been held, and others are in the offing, at which Florida shippers and packing house men have been heard on this important feature of Florida's marketing problem. Final action on the matter has not been taken, but the members of the Commission are giving serious attention to the matter.

The Commission also is closely watching developments in the course of the Magnuson bill now pending in congress. This bill would give the Interstate Commerce Commission the right to regulate truck weights in interstate commerce, which may open a vast new market for Florida citrus fruits. The new market, which includes Kentucky, Illinois, Ohio and Indiana, is now practically barred from the use of Florida fruits because of Kentucky's 18,000-pound limit on trucks passing through the state. Florida shippers hope for a minimum limit of 35,000 pounds. The Commission is exerting its influence for the passage of the bill.

Practical grove practices cost money and labor — but less money and little more labor than imperfect practices.

THE VITAMIN C, SOLIDS AND ACID IN ORANGE AND GRAPEFRUIT JUICES USED FOR CANNING PURPOSES.

(Continued from page 5)

and 20% from less than 5 tests. At least 6 tests a day make up the mean values for vitamin C, while about 10 tests represented solids and acid. On the basis of 25 days a month, the monthly averages represent 24,000 to 40,000 gallons of juice, or about 10,000 boxes of fruit.

It should be noted that the latter part of January 1940 marked a period of severely cold weather. At that time freezing conditions for citrus were obtained on several nights. During February and March the weather remained moderately cold.

Results

Vitamin C (ascorbic acid): Tables 2 and 3 show comparatively high vitamin C content during two seasons, 1938-39, 1939-40. It was especially high during 1938-39 when the monthly averages were often 0.60 milligrams per milliliter and higher. Occasionally during that season, orange juice used at the canning plant contained vitamin C as high as 0.80 mg./ml. of juice. In a report of the Council on Foods of the American Medical Association (3) 1000 International Units (50 mg.) of vitamin C was suggested as a suitable daily adult consumption. On this basis only slightly more than two ounces of this highest test orange juice would suffice.

So far during this present season the high vitamin level of the juice has persisted. The average from November, 1940, to March, 1941, was 0.65 for orange juice and 0.48 mg./ml. for grapefruit juice. Both results were slightly above the same period for 1938-1939. The February peak observed for both oranges and grapefruit during 1938-1939 did not occur at the same time during the present season (1940-1941). The averages so far this season are as follows:

November: Orange, 0.64 mg./ml; Grapefruit, none.

December: Orange, 0.67 mg./ml; Grapefruit, 0.47 mg./ml.

January: Orange, 0.65 mg./ml; Grapefruit, 0.47 mg./ml.

February: Orange, 0.64 mg./ml; Grapefruit, none.

March: Orange, 0.60 mg./ml; Grapefruit, 0.49 mg./ml.

A report by Harding (4) of the ascorbic acid content of 9 varieties of Florida oranges showed 0.60 mg./ml. to be the highest average value encountered in that work during the two seasons of 1936-1938. A rough estimate made from his graphs for the period September to April yields an average figure of about 0.50. An average computed from 302 determinations reported by Beacham and Bonney (1) produces a value of 0.51 mg. of vitamin C per ml. of orange juice. This covers fruit of several varieties from scattered districts of Florida during a period from October 1936 to March 1937. The level for these two seasons was thus about the same as that for 1939-1940, but lower than that reported herein for 1938-1939 and 1940-1941. Comparatively low vitamin C content was encountered in the spring of 1938, when this work was begun. Oranges used at the canning plant from April to June 1938 averaged 0.40 mg., and the Valencias after March as reported by Harding (3) had vitamin C contents of less than 0.40 mg./ml.

Grapefruit juice was found to maintain a fairly constant ascorbic acid value throughout the season. By June it was practically the same as orange juice. During the spring of 1938 the content of vitamin C for grapefruit juice averaged 0.35 mg./ml. Since December 1938 the vitamin C content has maintained a consistently higher level, usually exceeding .40 mg./ml. of juice. See Tables 2 and 3.

(Continued on page 12)

TABLE 1

The Vitamin C Contents of Orange Juice and their corresponding Acidities.

A. Grouped by Steps of Vitamin C Content

Vit. C Range	Frequency	Average Acid	Acid Range
(mg./ml.)		(%)	(%)
0.30—0.39	3	0.47	0.38 to 0.58
0.40—0.49	20	1.02	0.68 to 1.38
0.50—0.59	66	1.16	0.68 to 1.74
0.60—0.69	55	1.23	0.83 to 1.91
0.70—0.79	9	1.32	1.00 to 1.61

Total of 153 tests

B. Grouped by Steps of Acid Content.

Acid	Frequency	Average Vitamin C	Vitamin C Range
(%)		(mg./ml.)	(mg./ml.)
0.70—	9	0.57	0.49 to 0.62
0.90—	81	0.60	0.52 to 0.68
1.10—	64	0.61	0.50 to 0.73
1.30	16	0.62	0.57 to 0.74

Total of 170 tests

TABLE 2

Seasonal Changes in Vitamin C, Solids and Acid of **Orange** Juice. Average values calculated from the daily laboratory records.

MONTH	VITAMIN C		SOLIDS		ACID		RATIO Solids/Acid	
	1938 1939	1939 1940	1938 1939	1939 1940	1938 1939	1939 1940	1938 1939	1939 1940
	(mg./ml.)		(%)	(%)	(%)	(%)		
December	0.60	0.59	11.0	10.4	1.05	0.93	10.5	11.2
January	0.62	0.61	11.8	11.4	1.04	1.00	11.3	11.4
February	0.65	0.55	12.6	11.8	1.01	1.05	12.5	11.2
March	0.60	0.50	12.5	11.4	1.04	0.96	12.0	11.9
April	0.56	0.46	12.6	11.2	1.05	0.83	12.0	13.5
May	0.47	0.44	11.7	11.1	0.90	0.74	13.0	15.0
June	0.45*	0.42*	11.3	11.2	0.75	0.67	15.1	16.7
Season Av.	0.56	0.51	11.9	11.2	0.98	0.88	12.1	12.7

*Average for June 1-15.

THE VITAMIN C, SOLIDS AND ACID IN ORANGE AND GRAPEFRUIT JUICES USED FOR CANNING PURPOSES.

(Continued from page 9)

Relationship of Vitamin C and Acidity

From November 25, 1938 to January 14, 1939, tests were made on juice samples from about 10 oranges taken at random from the trucks and the vitamin C values were grouped in steps of 0.10 mg./ml. The frequency distributions are shown in Table 1. By frequency is meant the number of times a particular value of vitamin C was found to fall within a given group. Thus, out of 153 tests made on vitamin C, 9 were in the group of between 0.70 and 0.80 mg./ml.

Interpretation of Table 1 seems possible only in broad terms, namely, that high vitamin C was accompanied by high acidity and low vitamin content by low acidity. This association is again indicated in a more general way by the data presented in Tables 2 and 3. The ratio of vitamin C to acidity remains fairly constant, and shows no significant seasonal trend.

It is interesting to note that the distribution of vitamin C suggests a type of probability distribution. Table 1-B shows results grouped by steps of acidity of 170 tests on each of 160 gallons of juice. On the basis of these, one could expect a vitamin C content between 0.50 and 0.60 mg./ml., 66 times out of 153 samples, or a probability of 43 per cent; likewise, one could expect an acid content between 0.90 and 1.10 per cent in 81 samples out of 170, or a probability of 48 per cent.

Total Soluble Solids

In orange juice the solids content increased to a peak in February. During the season of 1938-1939 this leveled off to a plateau of nearly constant solids until May when a sharp decline occurred. A further decrease in June brought the solids to a level comparable to that of December. During 1939-1940 the solids content remained fairly constant after the February maximum. For that entire season the solids were 0.7 per cent lower than for the season 1938-1939.

In grapefruit juice the solids content was 0.8 per cent lower for 1939-1940 than for the 1938-1939 season. Unlike orange juice, no prominent peak value occurred in February. A gradual increase of solids was noted during 1938-1939 until May. The solids were remarkably constant during 1939-1940, except for one high average for January. As was noted for orange juice, the June values for grapefruit juice were about the same as those for December.

Total Acid

During the season of 1938-1939 the acid content of orange juice remained quite constant until May, resulting in a fairly constant solids-acid ratio from February to May. This differed from the findings for 1939-1940 wherein the ratio rapidly increased after February, due to the steady decline of acidity.

During 1938-1939 the acid content of grapefruit juice was also quite constant until the month of May. However, since the solids gradually increased during the first five months a slow increase in the solids-acid ratio occurred. During 1939-1940 the acidity of grapefruit was highest in January, after which it decreased until May, then remained constant until the end of the season. The ratio increased slightly, but in an irregular manner.

Discussion

Reference to the extended investigation of solids and acid by Harding, et al. (5) of the principal varieties of Florida oranges showed a general increase in solids and a general downward trend of acid as the fruit developed and ripened on the tree. When consideration is given to the mixed varieties of fruit of unknown rootstock used at the canning plant, the data reported herein show in general values similar to those reported by the above mentioned authors.

Summary

An extended program of investigation has been reported on orange and grapefruit juices extracted for canning purposes by the Dr. P. Phillips Canning Co. The vitamin C, total soluble solids and total acid contents have been discussed. Tests were made on aliquots of 160 gallons of freshly reamed juice. The study utilizes monthly averages on about 10,000 boxes of fruit, with yearly averages on about 70,000 boxes.

Monthly averages for vitamin C content ranged from 0.67 to 0.42 mg./ml. in orange juice, and from 0.49 to 0.35 mg./ml. in grapefruit juice.

The association in orange juice of high vitamin C content with high acidity and low vitamin content with low acidity has been discussed.

Monthly averages for total solids ranged from 12.6 to 10.4 per cent for oranges, and from 11.3 to 9.5 per cent for grapefruit. For total acid these averages ranged from 1.05 to 0.67 per cent in orange juice, and from 1.54 to 1.23 per cent in grapefruit juice.

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TABLE 3

Seasonal Changes in Vitamin C, Solids and Acid of **Grapefruit** Juice.
Average values calculated from the daily laboratory records.

MONTH	VITAMIN C		SOLIDS		ACID		RATIO Solids/Acid	
	1938 1939	1939 1940	1938 1939	1939 1940	1938 1939	1939 1940	1938 1939	1939 1940
	(mg./ml.)		(%)	(%)	(%)	(%)		
December	0.44	0.43	10.3	10.0	1.54	1.39	6.7	7.2
January	0.46	0.44	10.5	10.5	1.49	1.53	7.1	6.9
February	0.47	0.44	10.7	10.0	1.54	1.39	7.0	7.2
March	0.46	0.40	10.8	9.8	1.50	1.31	7.2	7.5
April	0.45	0.40	11.3	9.5	1.55	1.23	7.3	7.7
May	0.43	0.40	11.2	9.7	1.43	1.26	7.8	7.7
June	0.43*	0.42*	10.6	9.8	1.25	1.25	8.5	7.9
Season Av.	0.45	0.42	10.8	9.9	1.47	1.34	7.4	7.4

*Average for June 1-15.

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BORERS IN SHADE TREES

(Continued from page 4)

promptly cut down any tree which borers have killed. This will diminish the number of borers in the neighborhood which may attack any other tree which may not be perfectly healthy. Even a healthy tree may, if subjected to too frequent attacks of these borers due to great abundance of them in the neighborhood, finally have its vitality so lowered as to succumb to their attacks. This applies equally well to pine trees as to deciduous trees. Any pine tree which is dead or evidently dying, whether from causes just listed or from lightning, or other causes, should be promptly cut down and cut up into fire wood. If the wood is cut up into pieces of stove wood size and piled out in the sun it will dry out so promptly that these borers will not long find conditions favorable for their development, but if allowed to stand or allowed to lie on the ground after being cut down and not cut up, or piled in the shade, it will dry out slowly and conditions will remain favorable for a long time for the development of these borers.

The presence of the borers can usually be detected by the sap issuing from the wounds they make, or piles of sawdust will accumulate around the entraces to the burrows or around the base of the tree. Young trees recently transplanted should have their trunks protected from the direct rays of the sun, particularly the noon day sun. Standing a board upright on the south side of the tree will accomplish this purpose, or one may drape Spanish moss or other material around the trunk of the tree.

To sum them up, the first protection of shade trees from borers is by good care to keep the trees in a healthy growing condition. Secondly, any trees which, because of accident or neglect, have been killed by these borers or are obviously dying, should be promptly cut down and cut into fire wood, which should be piled in the sun, not in a shady place. Thirdly, if the borers are discovered before they have done too much damage, painting with whitewash will sometimes save the tree.

A Note to Citrus Growers

The citrus aphid is getting very numerous in many sections and many growers will want to take measures against the insect. Most growers wait too long before starting their spray or dusting for this pest. If tne half grown leaves are curled, it is not of much use to dust those particular leaves. The damage has been done and the aphids will soon be leaving those leaves. Of course, if there is still much new growth coming on, the trees, killing the aphids in the curled leaves will give that much protection to the young and tender growth.

Aphids do most of their damage in the very early stages of the growth of a young sprout when it is just pushing out from the twigs. The sprouts may be only a fraction of an inch long. A dozen or even less aphids sucking on this young sprout may completely stop its growth thus preventing the development of what would be a twig several inches long with leaves, perhaps blossoms and fruit. It will be particularly important to watch tangerines and other varieties that are late in putting out their growth. Due to the cold of last winter the growth is very uneven and this has furnished food for aphids over a long period and is the cause of a heavy infestation. At this stage of the development of an infestation the control measures would be dusting with a 3 percent nicotine sulfate-lime dust but the air must be quiet; enough wind to sway the Spanish moss on the trees is enough to seriously interfere with the kill. The temperature also should not be much below 70 degrees.

Dusting is much quicker and usually more thorough than spraying if there is no wind but some growers may prefer to spray, particularly if they want to put on at the same time a fungicide or nutritional spray.

An excellent spreader for Black Leaf 40 or other nicotine sulfate is bordeauz. Use nicotine sulfate at the rate of about one part to 800 of bordeaux. In other words, a hundred gallons would call for a pint. One can use one of the new spreaders on the market. Penetrol and certain tar oil soaps are available in most sections. With these better spreaders the nicotine can be cut down to half. In other words a half pint to a hundred gallons. When the wind is blowing or the temperaturue is down to 60 degrees or so this will give a better kill than dusting.

Florida Citrus Shippers Support Magnuson Bill

The citrus industry is closely watching developments in the course of the Magnuson bill, now pending in Congress. This bill would give the Interstate Commerce Commission the right to regulate truck weights in interstate commerce, which may open a vast new market for Florida fruits —an area containing more than 20 million people—in time for the 1941-41 marketing season. The new market, which includes Kentucky, Illinois, Ohio, and Indiana, for all practical purposes is now barred from truck shipments of citrus from Florida because of Kentucky's 18,000 pound maximum load limit on trucks passing through that state. A minimum of approximately 35,000 pounds is needed for economical hauling of citrus by trucks.

In a report to the I. C. C. urging that the legislation be passed, the citrus commission pointed to the disparity in truck shipments to the area north of the Kentucky-Tennessee state line, compared with those reaching Virginia, Maryland, and the District of Columbia. This latter area has a population of less than 5 million, but during the 1939-40 shipping season received 1,358,800 boxes of Florida citrus by truck. The commission then went on to point out that with 20 million people, the area north of the Kentucky and Tennessee received only 245,600 boxes during the same season. Some revision of Tennessee's truck law also would be helpful, the citrus board said, as that state's maximnm load limit is only 24,000 pounds.

A citrus fruit truck averages about 12,000 pounds net, the commission advised the commerce board, which restricts the pay load to 66 boxes of fruit. Normal loads of these vehicles is 300 boxes, or a gross weight of from 32 to 35 thousand pounds, far above the limitations imposed by Kentucky and Tennessee.

Members of the Florida congressional delegation have indicated they will assist in any legislative process to correct the situation. State directors of the Florida Citrus Growers, Ins., have given direct approval to the Magnuson bill, and have conveyed word of their action to the Florida congressmen.

The Western Hemisphere, including the United States, imports over 95 per cent of its total requirements of rubber from outside the hemisphere.

The LYONIZER

Department

COMPILED BY THE LYONS FERTILIZER CO.

Reports of Lyons Field Men . . .

POLK & HIGHLANDS COUNTIES

J. M. (Jim) Sample

The rains have brought out a heavy flush of July growth in most groves throughout this territory. In some cases bloom is accompanying this growth and where the trees were most severely damaged by the early summer drought the new bloom is more prevalent, with bloom on grapefruit and valencias more predominant. Considering the territory as a whole the grapefruit, valencia and tangerine crop is light as compared to normal production. The tangerine crop is extremely light. There is a definite feeling of optimism prevailing among the growers regarding prices for the coming season. Rains have made oil spraying hazardous but with the severe scale infestation growers are spraying between showers.

SOUTHWEST FLORIDA

F. W. (Felton) Scott

We have had some very beneficial rains in this territory during the past month and as a consequence groves are looking very good. Indications at this time are that the fruit crop will be very light in this section on all varieties and growers are feeling encouraged at the prospect of getting fair prices for their crops this fall. Vegetable growers are clearing in many sections with the idea of getting this land ready for fall planting. There is a large acreage of new land being cleared in the Ruskin section and it appears that this particular section will have its largest acreage under cultivation this fall. Growers all over the territory are either planting or getting ready to plant their seed beds.

NORTH CENTRAL FLORIDA

V. E. (Val) Bourland

Groves are looking better in Orange and Lake counties than they have in a number of years. The summer flush of growth has been very general, and while the fruit crop is light the quality is good, and it appears that we are going to have some nice fruit this fall. There hasn't been any interest shown in buying fruit on the tree so far this summer, and we have heard very little about prices that will be offered. All growers that we have talked with are of the opinion that the prices will be good. They are basing their opinion on the reported small crop of fruit and the very definite fact that there is more money in circulation.

WEST CENTRAL FLORIDA

E. A. (Mac) McCartney

There has been plenty of rain during the past few weeks, and groves have certainly made a fine response. The summer flush of growth has been very vigorous and trees are in the best shape that they have been during the past few years. The crop of fruit is definitely short in this territory and while we had a scattering of late bloom it was not heavy enough to affect the total crop. This territory is planted heavy to tangerines and as in other sections of the state this variety of fruit is extremely light. The vegetable growers in this section are making plans for their fall planting, and it now appears that this section will see a great deal of activity in growing truck crops this fall.

HILLSBOROUGH & PINELLAS COUNTIES

C. S. (Charlie) Little

During the past month we have noticed an occasional grove that showed some bloom, but as a whole this territory saw a number of growers disappointed as they were expecting a heavy late bloom. As previously reported the crop in this section will be light. However, growers are making a determined effort to produce a real quality crop, and if this is done and the light crop will result in better prices then most of our growers have enough fruit to make for a successful season. There is a great deal of activity with the spray machines at this time, and all growers are trying to get their scales insects under control.

No tree or plant can forever produce profitable crops without the aid of proper fertilization and spray, coupled with other modern cultural methods—the better the program the more resultful will be the production.

Horticultural Hints

This is probably the one month during the year when the grove can give you a breathing spell. Most of you are planning to get away on a short vacation at this time, but we feel that we should remind you of several operations that must be cared for if you are to have a crop of quality fruit this fall.

Rust mite are extremely active at this time and weather conditions have not been very cooperative during the past few weeks. However, we urge you to keep a close check on these pests and get them under control even though the spraying has to be done between showers. Scale insects are also very active, and it is extremely important that this pest be placed under control.

Young trees should be hoed or cultivated in some manner, and we also suggest small applications of fertilizer at short intervals.

In the vegetable sections many growers are preparing their seed beds from which will come plants for the fall crop. It is extremely advisable that these plants be cared for in the best possible manner to insure a fine vigorous start. Be sure that your soil is in the proper condition and if there is some doubt about this matter we suggest that you contact the Lyons Field Man in your territory. He will be glad to consult with you, take samples of your soil, and cooperate with you in every possible way.

RECENT CULTURAL DEVELEOPMENTS STUDIED AT SALES MEETING

Following a long established policy the annual sales meeting of the Lyons salemen and field operatives held in Clearwater last week was devoted to an intensive study and discussion of recent developments in the growing of fruit and vegetables.

Actual clinics were conducted in various grove and truck properties and recognized authorities were present to outline and discuss varied problems.

W. L. Waring, Jr., president and general manager of the company supervised the meeting.

P. E. Snyder, Manager Polk County Grove Service Inc., Uses Lyons Fertilizers Exclusively and Declares Results To Be Excellent

P. E. Snyder, manager of the Polk County Grove Service, Inc., is pictured in one of the fine groves for which his company acts as caretakers. During the past four years this company has made an outstanding success in the care of grove property, having under their care approximately 1000 acres of groves which year after year are operated in a manner which produces exceptionally fine fruit and results in producing a satisfactory profit for the owners . . . Naturally this record could only be accomplished with sound fertilizer methods.

In recent years this organization has handled numerous groves for out of state owners, taking care of all details from grove culture to the marketing of the fruit and have a splendid record for making money for their customers. They use the latest type equipment in their grove culture and their methods of application are thoroughly modern . . . They have used Lyons Fertilizers exclusively since their organization was founded and state that they have excellent results from it — which is the verdict of a large number of other successful Florida growers.

EFFECT OF FREEZE DAMAGE ON CITRUS TREES AND FRUIT IN RELATION TO GROVE PRACTICES.

(Continued from page 7)

was induced by the use of these elements which magnified the magnesium shortage and consequently lowered the resistance of the trees to cold injury. In proportion to the crop, the trees on the zinc and copper and the zinc, copper, and manganese programs showed less dead wood than the trees on the N-P-K program. The addition of magnesium to the zinc, copper, and manganese, thereby constituting a complete nutritional program, increased the crop to 491 pounds of fruit per tree and reduced the amount of dead wood to 4.3 pounds per tree.

The damage resulting from the freeze in the block of Marsh Seedless grapefruit was closely correlated with that in the block of Pineapple oranges; however, the differences in dead wood were not so outstanding because the trees on the complete nutritional program, due to the heavy foliage, had a heavy infestation of purple scales which resulted in some killing of wood before the pruning was done.

Since the crop production following a freeze is a reflection of the actual damage, it is a factor in determining the extent of recovery. The data presented in Table 4 show that heavy crops under certain unfavorable nutritional conditions will result in decreased tree resistance and smaller crops in subsequent years. Where all trees are subjected to the same degree of cold, it would be natural to expect similar crops; however, the production records of 1940-41 show that this assumption is unfounded and that the amount of damage has a direct effect on not only the yield but also the quality and size of the fruit.

In 1940-41 the trees on the N-P-K program produced only 160 pounds of fruit per tree. This low production was closely followed by the trees receiving zinc and copper and zinc, copper, and manganese which produced 166 and 172 pounds of fruit per tree, respectively. It should be remembered that the trees on all three of these programs, which are incomplete, had the highest percentage of foliage injury and dead wood. The trees on the complete nutritional program produced 327 pounds of fruit per tree which is twice the amount produced by the trees on the N-P-K program. Fruit of better color and quality and larger sizes was produced by the trees on the complete nutritional program. The fruit from the trees on the N-P-K program had rough, thick skins of a yellowish rather than reddish color and graded heavily to small sizes, only 45 per cent being No. 1's and 2's, while the fruit from the trees on the complete nutritional program had smooth textured, thin skins of a deep reddish color and graded heavily to large sizes with 88 per cent of the fruit being No. 1's and 2's. The use of zinc and copper and zinc, copper, and manganese increased production and improved fruit quality but it was not until a combination of all four elements was applied that a pronounced effect was evident.

Results of the freeze of November, 1940, were similar to but less severe than those of the freeze of January, 1940. Considerable leaf drop, wood damage, and some fruit damage occurred on the trees on the N-P-K program while very little cold damage was apparent on the trees on the complete nutritional program. Although the fruit from the trees on the complete nutritional program contained some ice at the time of the freeze of November, 1940, the superior condition of the trees and fruit enabled them to quickly overcome any detrimental effects.

A striking comparison was apparent in another experiment which involved four varieties of grapefruit, divided into two plots. These plots, which were adjacent, received the same treatment until two years before the freeze of January, 1940. Since that time one plot has continued to receive the acid inorganic N-P-K program but the other plot has received the complete nutritional program with basic organic fertilizer. The trees in the latter plot have grown very vigorously and are in excellent condition while trees in the former plot are in a poor condition and have continued to show sparse foliage, produce little fruit, and show acute deficiency symptoms of magnesium, manganese, copper, and zinc. Following the freeze of January, 1940, the trees in the acid inorganic plot were completely defoliated and a considerable amount of wood was damaged while the trees on the complete nutritional program suffered partial defoliation and medium wood damage (Table 3). There was little difference in fruit damage in either plot but it should be noted that the temperature was below 20 degrees F. for eight hours in these plots. The fruit droppage from the trees in the acid inorganic N-P-K plot was considerably higher than that in the plot on the complete nutritional program.

The recovery of the trees in these two plots was strikingly contrasted. Pruning records taken in May and June of 1940 (Table 5) showed that the seedy grapefruit on the complete nutritional program had only 6.59 pounds of dead wood per tree while the trees in the plot on the incomplete program had 16.08 pounds of dead wood per tree, two and one-half times as much as the former plot. Trees in the plot on the incomplete program continued to die back and by fall had considerable dead wood, showing that weakened wood reveals ill effects from cold long after the damage actually occurs. Similar results were produced on Marsh Seedless grapefruit. The trees on the complete nutritional program had only 3.14 pounds of dead wood compared with 9.75 pounds from the trees in the plot on the incomplete program. There was a greater percentage of increase in the amount of dead wood in the Marsh Seedless grapefruit on the incomplete program than there was in the seedy

TABLE 5
Amount of Dead Wood and Production Record of Cold-Injured Seedy and Seedless Grapefruit on Two Different Nutritional Programs.

Treatment	Dead Wood* lbs./tree		Fruit** lbs./tree	
	Seedy	Seedless	Seedy	Seedless
N-P-K (Acid Inorganic)	16.08	9.75	117.0	520.0
N-P-K-Mn-Zn-Cu-Mg (Basic Organic)	6.59	3.14	442.7	803.7
Percent Increase	160	211	278	54

*June, 1940
**1940-41 Season

grapefruit on the same program, and this is explained by the fact that the magnesium requirement of seedy grapefruit is far greater than that of seedless grapefruit. The magnesium application in the plot on the complete nutritional program did not amply supply the magnesium requirement of the seedy grapefruit and consequently the trees in this plot had lower resistance to cold, while the same magnesium application sufficiently supplied the requirement of the Marsh Seedless grapefruit. The Marsh Seedless trees in the plot on the incomplete program suffered damage from both low temperatures and the presence of deficiencies of copper, zinc, manganese and magnesium, while those trees in the plot on the complete nutritional program suffered damage from low temperatures alone.

The trees on the complete nutritional program produced a vigorous and healthy growth; a heavy bloom was set and a good crop produced. Trees on the incomplete program responded slowly and produced a weak growth, much of which was clustered around the large limbs. The leaves were small and narrow and showed the patterns of copper, zinc, and manganese deficiencies. The trees were sparsely foliated throughout the year and produced fruit grading from very small sizes to extremely large sizes that were puffy. In this plot trees of the seedy varieties produced only 117 pounds of fruit per tree this season and trees of the seedless variety produced 520 pounds per tree, while trees of the seedy varieties in the plot on the complete nutritional program produced 443 pounds of fruit per tree and the Marsh Seedless trees produced 804 pounds of fruit per tree, an increase of 211 per cent and 54 per cent, respectively (Table 5).

During the freeze of November, 1940, there was an opportunity to study the effects of the application of nutrient elements at critical temperatures. Trees on the complete nutritional program suffered some defoliation and slight fruit damage; at the same time the trees on the incomplete program suffered heavy foliage and fruit damage. The trees in the latter plot were 100 percent defoliated and suffered as much if not more wood damage than they did during the freeze of January, 1940. A heavy fruit drop followed the cold and the fruit which hung on the trees could not be salvaged due to extreme dryness. Because the trees in this plot will have to be cut back to the main trunk this spring, several years will be required to grow trees that will produce a normal crop of fruit, whereas the trees on the complete nutritional program are in fair condition.

From these data, it can be concluded that the extent of cold damage is a reflection of the tree condition which is determined by the proper or improper use of the tree nutrients, including zinc, copper, manganese, and magnesium. The use of all four of these elements, in addition to nitrogen, phosphorus, and potassium, results in sufficiently vigorous tree growth to minimize the effects of low temperatures, whereas a deficiency of one or more of these elements tends to intensify the damage resulting from low temperatures.

A more thorough knowledge of fertility problems and the correlation of damage to certain deficiencies reveals ways of lessening the severity of cold injury and hastening recovery in the future. There is no magical virtue in any single element that will change the physical complex of the tree for its dependent upon the proper use of all of the nutrients known to be essential to proper tree growth. The data presented show the importance of a complete nutritional program as a pertinent factor in determining the degree of cold damage and recovery. It is only after all of these elements are supplied that certain physical characteristics become evident and enable the trees to become more resistant to low temperature or any other unfavorable condition.

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Commercial Plant Food Consumption Hits Record High

An all-time record for fertilizer consumption was established by farmers with 8,311,000 tons of commercial fertilizer used on farms during the past crop year, according to the annual consumption report made public by The National Fertilizer Association. This is an increase of more than one-half million tons over the prior year.

"Tonnage figures in themselves do not tell the complete story of plant-food consumption in this banner year, since there has been a significant increase in the amount of plant-food contained in a ton of fertilizer," said Charles J. Brand, Executive Secretary of the Association. "This year's tonnage figure was 16 per cent above 1920 but the amount of plantfood contained and used was 64 per cent greater."

This year's tonnage includes 7,839,000 tons sold by commercial producers, 27,000 tons distributed by TVA and 444,000 tons distributed by AAA. The increase over 1939 amounted to 529,000 tons, with the commercial industry accounting for 234,000 tons of the increase and the Government agencies accounting for the other 295,000 tons.

It seems likely that another tonnage increase is in store for next year since tag sale figures for the first four months of 1941 are 9 per cent over 1940.

Distribution of fertilizer by Government agencies has been increasing in quantity in recent years. Tonnage ratio rose from practically nothing in 1935 to 5.66 per cent of total consumption in 1940. The proportion of plantfood used in 1940 accounted for by these two agencies was 9.68 per cent, in contrast to the 5.66 per cent of gross tonnage.

About 50 percent of all United States farm people live in 13 Southern States, but they receive only 30 percent of the national farm income.

Facts About The Japanese Beetle

J. R. WATSON, Entomologist
Florida Experiment Station

The discovery of a few specimens of the Japanese beetle in Florida and the wide distribution of traps has led to considerable interest in this insect on the part of our growers and gardners. Let me emphasize here that the traps widely set over the state are for the purpose of scouting for these beetles. They are not intended as a control measure but simply to determine as far as possible the presence or absence of this beetle in a community.

The Japanese beetle is a June bug, a small one, less than half an inch long, ranging in fact from 3-8ths to 7-16ths on the average. The wing covers are brown; the head and thorax are a bluish-green. As in most June bugs the end of the abdomen projects out behind the wing covers. This too is bluish-green but it carries two white spots. They are about the size of the head of a pin, one on each side. These two white spots will help to distinguish the Japanese beetle from several other members of this tribe which are common in Florida. The nearest relative of the Japanese beetle here is known as **Anomala marginata** or the "margined anomala." This is decidedly larger than the Japanese beetle. The wing covers and the head and thorax are about the same color. They do not make the marked contrast as seen in the Japanese beetle.

There are several species of flower beetles that are ofter mistaken for the Japanese beetle. They are about the same size and shape as the Japanese beetle, but differ in color. These flower beetles are often found in roses and other large flowers and in the blooms of thistles. The green flower beetle is about the same size and shape of the Japanese beetle but its wing covers are also green as is the thorax. Instead of the two small white spots on the end of the abdomen there is a conspicuous white semi-circle. Another flower beetle is brown both on its head and thorax and wing covers but its head is considerably darker than the wing covers, more of a blackish-brown than a green. A third common flower beetle has a conspicuous triangle, pale yellow in color on an almost black background. None of these flower beetles have the brown wing covers and green head and thorax of the Japanese beetle.

In habits the Japanese beetle much resembles our common June bugs. This is to say the larvae are white grubs. They live in the ground feeding on the roots of grasses and herbs until about about the latter part of June when the adults begin to emerge from pupae made by these grubs. The adults feed on various plants, especially the leaves of trees and bushes for several weeks. In the North they begin to dsiappear the last of July and August. In places they are exceedingly numerous and do a great deal of damage. The grubs severely damage lawns. The "margin anomala" closely parallels the Japanese beetle in its habits. In a few instances it has invaded orange groves in immense numbers and has fed on the tender growth including the buds, blossoms, and young fruit, but these swarms are comparatively rare. This June bug, however, is widely spread over the state, but usually in small numbers. Two questions arise in our minds: "Is the Japanese beetle likely to get abundant in Florida, and, if so, what will it do in our groves and gardens?" As to this first question we can only guess the answer. In its native home in Asia it is regarded as a temperate region insect. In regard to the second question: should it become abundant in Florida it might very well be a first-class pest on many crops including citrus. Life history and habits are similar to the "margined anomala" which as we have mentioned before, has occasionally been a severe pest of citrus. It would probably be a number of years at least before it would become abundant in Florida, if ever. Meanwhile certain parasites which the U. S. Bureau of Entomology and Plant Quarantine have introduced from Asia are spreading and multiplying. Let us hope that by the time the Japanese beetle reaches Florida in any numbers these parasites will have become sufficiently abundant to give reasonable control. Meanwhile if any growers find beetles which answer to the description given, it will be a favor both to yourself and to the Experiment Station if you would mail it to the Station or the State Plant Board or some other agency. The insects of course, should be killed before sending them through the mails. This can be done by dropping them in gasoline, kerosene, or some of the pyrethrum oil household sprays, like Gulfspray.

In the year from July 1, 1939, to June 30, 1940, farm bankruptcies were at their lowest point in 18 years.

Prospects for Deciduous Fruit and Nut Crops In Florida

G. H. BLACKMON, Horticulturist
Florida Agricultural Experiment Station

Florida does not have a large production of any one deciduous fruit but, when all are considered together, they return a considerable amount of money to the farmers of the state. Many of these crops are ready for sale at a time when there is frequently little to be sold from many farms and the cash thus realized is quite helpful in meeting the family budget. Such fruits as grapes, peaches, plums, Japanese persimmons, pears and berries make up the bulk of the deciduous fruits produced in Florida.

These deciduous fruits are frequently grown primarily for home consumption either as fresh fruit or processed in one of the various ways for use later on. In such cases, the surplus is sold on the local market or to trucks as long as the supply and demand last. Those in the field of nutrition and other similar activities who are constantly advocating a pantry full of such fruits are doing a fine work. During the out-of-season period for fresh fruit, such fruit, when conserved by making into preserves, jams and other good products add something to the table which is wholesome and agreeable.

This "live-at-home" program, of which fruit is a part, is of special significance at this time during the present existing national emergency. It will prove helpful in carrying out the defense program of our nation and will mean a material reduction in the amount of cash outlay required to meet home living expenses.

The peach production in Florida is forecast to be slightly less than it was in 1940, according to the Crop Report for June 11, 1941, issued by the Agricultural Marketing Service of the U. S. Dept. of Agriculture. The fruit matured and ripened about the same time as in 1940, which is a much later date than that when most of the early varieties of peaches grown in Florida are usually ready for the market. This hampered somewhat the sale of the fruit owing to competition with that from other peach-producing areas and materially affected the amount of money returned from the crop. Although the season was late, the quality and flavor of the fruit was good, which helped in the sale of the crop.

Plums are grown in Florida generally in small home orchards only and the fruit is mostly used for home consumption, although some are sold in local markets. Prospects for plums are about average for other years, although there was some cold damage to both trees and fruit buds during the past season.

The Crop Report forecasts a somewhat lighter pear crop in 1941 than that produced in 1940. This fruit should mature and be ready for harvest at about the usual time.

In some sections Japanese persimmon trees suffered cold injury during the severe freeze last November and this has materially affected the crop.Production this year will be less than that in 1940, but the fruit should be of good size and quality.

The grape harvest of the present season should about equal that for 1940. The season, however, like that of many other fruits, is somewhat later than the average.

The blueberry crop in West Florida yielded fairly well, considering the fact that plantings generally receives little attention as to cultivation and fertilization. The yields, when harvests are completed, will not differ greatly from those for the average year.

The prospects for pecans this year seem to be somewhat better than that for the crop in 1940. While the orchards generally in the eastern part of the state will probably not produce a total of more than 30 percent of last year's crop, those throughout the western parts of the state will yield a much greater production. Therefore, when estimates for all sections of the state are averaged, it would appear that the prospects this year for pecans are somewhat better than they were in 1940 for Florida as a whole. Here, as with other crops, the progressive grower who has kept abreast of research and practised the most improved methods or orchard management is the one who has the best crop prospects.

The 1940 tung crop in Florida was the largest of record and thus, this new horticultural enterprise has become definitely established on a commercial basis. Owing to the fact that tung-oil could not be imported in sufficient quantities to meet American requirements, the domestic production enjoyed a ready sale at a high price. Yields were satisfactory and showed a profit in orchards located and adequately fertilized and cultivated. A large percentage of the 1940 fruit has already been processed and much of the oil has been sold. However, the remaining unprocessed fruit is now all in the mills where the oil will be expelled by the expellors as rapidy as possibe.

The prospects for the 1941 production in Florida are not so good as they were a year ago for the 1940 crop. The freeze in November, 1940, did considerable damage to some orchards located in areas in which records show considerable cold injury over a period of years. In such orchards the yields will be very light. In other orchards in which there is generally less cold injury the trees came through in fairly good condition and have a fair crop of fruit this year. Therefore, the prospects for tung in Florida in 1941 indicate a much lower production than was harvested in 1940. Taking everything into consideration, the tung crop prospects in Florida for 1941 has been variously estimated to be about one-third of that produced last year.

Now, to summarize briefly, it would seem that the pecan production in Florida should be somewhat heavier in 1941 than it was in 1940, but that the tung crop will be much lighter. The peach, pear and Japanese persimmon production will be somewhat lighter this year than last, but the prospects for grapes, blueberries and plums are estimated to be about the same in 1941 as their total production in 1940.

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